Knowledge and Practices of Self-Care among People with Diabetes in South Western Uganda: A Cross-Sectional Study at a Regional Referral Hospital in Mbarara City.

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Abstract

Background: Diabetes is a chronic metabolic disease with increasing prevalence globally. Glycemic control is the ultimate management goal possible through self-care activities predominantly patient-driven and enhanced by one's knowledge. These consequently minimize associated adverse complications hence maintaining the quality of life among people with diabetes. Self-care knowledge and practice are globally found unsatisfying to control glycemia among many diabetic populations. There is a critical need to assess current knowledge and practice regarding self-care among diabetic people to control their diabetes. Hence the need to carry out this study.

Methods: We conducted a hospital-based cross-sectional study on 228 participants who were living with diabetes for at least six months since diagnosis. A standard tool, adopted and modified to suit the setting was used; the self-report Diabetic Knowledge Test Questionnaire for self-care knowledge and a revised version of the Summary Diabetes Self-Care Activities Questionnaire for practice. Both descriptive and logistic analysis was done using Stata software, version 13.

Results: Adequate diabetes self-care knowledge was average (56%) and adequate self-care practice was below average (35%). Major gaps in foot care, blood glucose testing, hypoglycemia recognition, and management. Multiple logistic regression revealed longer duration with diabetes and more frequency of receiving health education highly associated with adequate self-care knowledge and practice (duration ≥ 11 years, AOR: 2.9; P=0.014) and health education on every clinic visit (AOR: 4.0; P=0.005) for self-care knowledge while duration ≥ 6 years (AOR=3.3, P-value = 0.011) and health education twice from the time they started clinic visits (AOR= 0.2, P= 0.048) for self-care practice.

Conclusion: [a]

Interventions should be developed focusing on precise and user-friendly health education packages translated to local languages, and eye-catching to the audience, priority to newly diagnosed and less educated. A further study assessing appropriate health education delivery avenues to clients of various characteristics, especially rural communities.

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1 Introduction

Diabetes mellitus (DM) is a chronic metabolic disease characterized by increased levels of glucose in the blood (hyperglycemia) due to insulin deficiency (Type 1 Diabetes Mellitus) and/or insulin resistance (Type 2 Diabetes Mellitus) 1. Diabetes is among the top ten causes of death among adults globally and reportedly caused nearly four million deaths in 2017 2causing 1.6 million deaths in 2015, which was a 60% increase within 15 years from the year 20003. Worldwide, diabetes prevalence among adults was 382 million (8.3%) in 20134 and is predicted to rise to around 438 million (7.7%) by 2030 5. This prevalence is projected to reach 700 million by 2045, with a greater proportion in developing countries, especially in sub-Saharan Africa 6,7. d in Uganda, the prevalence is expected to rise from 2.2% in 2010 to 3.1% by 2030 5,8. A recent study in southwestern Uganda reported a high prevalence of diabetes at 18.7% among the population aged 45-80 years 9.

Appropriate and adequate daily self-care knowledge and practice among patients with diabetes is reported to significantly reduce the incidence of complications and related socio-economic burden to families and the health care system in terms of disability, prolonged hospitalization, and deaths 10. Adequate knowledge of self-care is critical for appropriate self-care practice 11,12. However, many previous studies in developing countries of which Uganda is inclusive, have revealed scanty information in self-care knowledge and practices among people with diabetes, especially from the rural settings 13-21.

Therefore, the current study aimed at assessing the self-care knowledge and practice as well as the factors affecting self-care among people with diabetes in South-western Ugandan which is majorly rural. The study findings will inform policymakers where to concentrate efforts to enhance self-care knowledge and improve practice among people living with diabetes in rural Uganda.

2 Methods

Study Design and Setting

It was a hospital-based cross-sectional study conducted at a regional referral and a teaching hospital located in South Western Uganda and participants were recruited and data collected for six weeks during October and November 2017. The hospital serves a population of over five million people from about 10 districts in south-western Uganda of which the greatest number is from rural areas 22, due to the reduced hospital costs compared to the private health care settings. The hospital operates a diabetic clinic once a week with an average of 50-70 patients, both follow-up and referral per clinic day (unpublished Hospital diabetic clinic record, July 2017).

Participants

All adults (18 years and older), who consented to participate, living with diabetes for at least six months since diagnosis, were recruited. The mentally ill, deaf, or critically ill and those unable to communicate in English or local languages were excluded. All participants who met this inclusion were selected to participate in the study. Participants were selected as they came in to attend the diabetic clinic at the data collection site.

Quality Control

The questionnaire (data collection tool) was pretested a week before the data collection to assess the difficulty of the questions, understanding, and ability of participants to answer the questions. The tool was translated to Runyankore (local language) and then back to English by an experienced person well versed in both languages. The research assistants were trained on how to use the tool to ensure that they administered it with clarity and within a short time without changing meaning.

Study Population and Data Collection

A sample size of 230 calculated using the Fleiss formula 23 for Cross-sectional and cohort studies were considered and the data was collected by the researcher assisted by two trained research assistants for six weeks during October and November 2017. Participants who had consented were consecutively selected due to irregular time intervals of participants reporting to the clinic, and they were screened for eligibility. An interviewer-administered questionnaire (See Supplementary file 1) with three sections was used: Section I (Participants Socio-demographic & Clinical characteristics) and Section II (Participants' Diabetic Knowledge Test Questionnaire) adapted with permission and slightly modified, to suit the Ugandan setting from Berhe *et al.,* 14. Section III covered Self-care practices among people with diabetes using the revised version of the summary diabetes self-care activities questionnaire (SDSCA) 24. Diet, Medication taking, blood glucose testing, Foot-care, and

Physical Activity were assessed to measure the self-care practice of diabetic patients and the frequency of self-care activities in the previous one week, and the previous one month for blood glucose testing because it was rarely practiced in a week.

Data Management and Analysis

The data was entered in Epinfo Version 6.0 designed data entry screen and a completed dataset was exported to STATA 13.0 for analysis. Participants' (socio-demographic and clinical) characteristics were summarized using means or medians for continuous variables and proportions for categorical variables. Self-care knowledge was analyzed by generating a binary variable (0= inadequate, 1= adequate) and the proportion of correct answers out of the total number of self-care questions was ascertained to generate the overall adequate knowledge (if they scored 70% or more based on the Nigerian study 25. One had adequate self-care practice if they scored 75% or more out of all the practice questions from the SDSCA scale based on the study by 26. Multivariate logistic regression was run to establish the factors associated with self-care knowledge and practice. At a significance level of 5%, all factors with $p<0.05$ in bivariate analysis were considered in the multivariate analysis. Adjusted odds ratios (AOR) and corresponding 95% confidence intervals were obtained.

3 Ethical Approval

The study was approved by the institutional Ethics Committee, and permission to conduct research was granted by the hospital management and the diabetic clinical team. Consent to participate was sought from each participant before data collection. Those who consented were informed about their freedom to withdraw from the study at any time without any penalties. Participants were assured of safety and confidentiality by allocating non-identifiable codes to each participant as well as conducting the interviews in a private space. Individual autonomy was respected.

4 Results

A total of 230 participants fulfilled the inclusion criteria and were recruited for the study. However, 2 participants withdrew from the study, hence a non response rate of 0.9%, because they were called to see the physician midway through their interviews and couldn't be traced thereafter. These two were excluded from the analysis.

Results from the analysis include; a summary of study participants' characteristics, knowledge, and practices regarding self-care, factors of self-care knowledge, and practice. The detailed results are presented in tables 1-5.

Demographic and clinical characteristics of Study participants

Demographic and clinical characteristics from Table 1, show that participants were predominantly aged 50 years or more (71.5%), female (66.7%), and living in rural areas (71%). The highest proportion had either primary level or no formal education (78.1 %). Many patients had multiple sources of health education, but 16.5% never received health education at the diabetic clinic.

Knowledge Regarding Self-care Practices among Study Participants

Close to half (44.1%) of study participants scored below the set cut-off of 70% for overall adequate knowledge on the diabetes self-care knowledge scale. The participant's knowledge regarding the individual self-care activities in diabetes care were shown in Table 2. Knowledge of specific self-care activities such as diet, foot care, exercise was generally good. However, a bigger proportion of participants did not think that shaking and sweating were signs of low blood sugar (63.9%); diet could affect blood sugar (61.7%) or sugary things are important when feeling dizzy (55.3%), hence poor at identification of signs of hypoglycemia and its first aid.

Factors Affecting Self-care Knowledge among Study Participants

From the multivariate logistic analysis shown in Table 3, receiving health education every clinic visit (AOR= 4.0, P- value<0.01) and living with DM for 11 years or more (P=0.014, AOR=2.9) were independently associated with self-care knowledge among people with diabetes. Receiving health education, every clinic visit had 4.0 times higher odds of knowing self-care practices when compared with those who had never received any health education after adjusting for the duration of living with diabetes. Likewise, the participants living with diabetes for 11 years or more had 2.9 times higher odds of knowing self-care practices when compared to those with diabetes for less than 5 years after adjusting for the frequency of receiving health education.

Self-care Practice among Study Participants

Table 1. T able I: Distribution of Socio-demographic and Clinical Characteristics. N= 228

Characteristic	F	%
Gender		
Male	76	33.3
Female	152	66.7
Residence type		
Rural	154	71.0
Urban	63	29.0
Age categories		
15-34	19	8.3
35-49	46	20.2
50-59	74	32.5
>60	89	39.0
Education level		
None	48	21.0
Primary	130	57.0
Secondary	33	14.5
Tertiary	17	7.5
Age at diagnosis of DM in years		
15-24	11	4.9
25-34	17	7.5
35-44	93	41.0
55-64	68	29.5
>65	39	17.1
Duration with diabetes mellitus		
Less than 5 years	121	53.3
6-10 years	61	26.9
11 years and above	45	19.8
Frequency of health education at the diabetic clinic		
Never	36	16.5
Once	34	15.6
Twice	43	19.7
More than twice	46	21.1
Every time of clinic visit	59	27.1
Sources of health education		
Health care workers	214	93.9
Media	153	67.1
Friends	127	55.7
Fellow diabetics	9	4.0
Family member	53	23.3
Type of DM	33	4.6
Type 1	193	85.4
Type 2		
Treatment type	148	65.5
Oral hypoglycemic drugs	52	23.0
Insulin therapy	26	11.5
Both		

Table 2. Distribution of Knowledge Regarding Self-care Practices

Knowledge area, N=228	Yes (%)	No (%)
Exercise and its importance		
Exercise can improve blood sugar levels	96.5	3.5
Rest helps regulate blood sugar levels	61.7	38.3
Exercise regulates blood sugars	83.7	16.3
People with diabetes should engage in a specific amount, type and level of exercise	76.1	23.9
Dietary activities		
Food for DM persons should have less or no fat or oils	94.7	5.3
Diet affects blood sugar levels	38.3	61.7
DM persons should have more fruits and vegetables on meal plan	96.0	4.0
Wound care and foot care		
Diabetic should cleanse cut with iodine or alcohol	33.5	66.5
Check feet regularly for cuts, sensation and circulation	86.3	13.7
Comfortable shoes should be worn regularly	86.8	13.6
Tight shoes and socks are not acceptable for diabetics	81.1	18.9
Extra care should be taken while cutting toenails	89.0	11.0
Signs of diabetic complications and first aid		
Diabetes causes loss of feeling in hands, fingers and feet	95.2	4.8
Feeling malaise indicates a diabetic danger sign	90.8	9.2
When dizzy, take sugary things	44.7	55.3
When dizzy, should test the sugar level	85.9	14.1
Shaking and sweating are signs of low blood sugar	36.1	63.9
Frequent urination and thirst are signs of high blood sugar	58.6	41.4
Overall self-care knowledge	f	%
Adequate	128	55.9
Inadequate	100	44.1

The overall score for adequate self-care practice in the past one week was suboptimal (35%) among participants. This was rated from all self-care practice questions answered correctly in the tool (cut-off 75% cut-off). Major gaps were seen in foot care activities as shown in Table 4. The frequency of self-care practice in the previous week had a remarkable percentage (28%) of participants who were non-adherent to oral hypoglycemics. Approximately half (48.3%) of participants did not examine their feet regularly (four times or more a week), 53.5% never dried in-between their toes regularly and the majority (62.7%) never inspected the inner surfaces of shoes regularly (Table 4).

Factors Affecting Self-care Practice among Study Participants

From Table 5, bivariate and multivariate findings are shown. The multivariate logistic analysis shows that having primary or basic education (p= 0.035), living with diabetes for more than 5 years (p=0.011 and 0.035 for duration of 6-10 years and 11 years or more respectively), receiving health education (0.048) twice were independent determinants of diabetes self-care practice as well as media as a source of health education (p=0.002).

COR- Unadjusted Odds Ratio, AOR-Adjusted Odds Ratio, *Statistically significant

5 Discussion:

The study explored the existing diabetes self-care knowledge and practice and factors affecting people living with diabetes in South Western Uganda. Broadly, 44% of the participants scored below the set cut-off (> 70%) for adequate self-care knowledge; and a big number, 65% had inadequate diabetes self-care practice in the previous week. The specific gaps in diabetes self-care knowledge were in detecting signs of hypoglycaemia (shaking and sweating as not a sign of low blood sugar, 63.9%); cause of high or low blood sugar (diet has no effect blood sugar, 61.7%), and knowledge of first aid in case of hypoglycaemia (sugary things are not important when feeling dizzy, 55.3%). The independent factors affecting self-care knowledge

Table 3. Logistic regression analysis at bivariate and multivariate level for participants' Characteristics (socio-demographic and clinical) and Self- care Knowledge

	Bivariate Analysis		Multivariate Analysis	
Variable	**COR [95% CI]**	**P-value**	**AOR [95% CI]**	**P-Value**
Education level		**0.0321** *		
None	1.0			
Primary	1.7 [0.83-3.28]			
Secondary	3.0 [1.16-7.81]			
Tertiary	4.5 [1.25-15.79]			
Duration with DM		**0.0009** *		
Less than 5 years	1.0		1.0	
6-10 years	2.1 [1.12-4.01]		1.8 [0.89-3.70]	0.100
11 years and above	3.7 [1.70-8.00]		2.9 [1.25-6.82]	0.014*
Frequency of self-care health education		**P<0.001** *		
Never	1.0		1.0	
Once	3.0 [1.10-7.94]		2.7 [1.00-7.40]	0.051
Twice	0.85 [033-2.23]		0.7 [0.24-1.77]	0.400
More than twice	3.1 [1.24-7.88]		2.4 [0.93-6.27]	0.069
Every clinic visit	5.8 [2.28-14.54]		4.0 [1.52-10.50]	0.005*
Sources of health education				
Health care workers;		**0.3108**		
No	1.0			
Yes	1.8 [0.56-5.96]			
Friends		**0.4561**		
No	1.0			
Yes	1.2 [0.72-2.09]			
Fellow diabetics		**0.0040** *		
No	1.0			
Yes	0.1 [0.01-0.74]			

COR-Unadjusted Odds Ratio,AOR-Adjusted odds ratio, *Statistically significant.

were: receiving health education every clinic visit and living with DM for 11 years or more.

Major gaps in self-care practice were identified in foot care, blood glucose testing, and adherence to oral medication. The independent factors affecting self-care practice were; Having primary/basic education; Living with diabetes for more than 5 years, receiving health education from the clinic twice, and media as a source of health education.

Diabetes Self-care Knowledge among Study Participants

In this study, the existence of diabetes self-care knowledge was generally inadequate with only 56% able to have adequate knowledge. This was slightly higher than, though close to findings by Odili et al in Nigeria 27,28 and Kassahun et al in Ethiopia 26 who found low levels of self-care knowledge at 39.5%+/-16.7% and 44.9% respectively.

More specifically, our study found that 61.7% of respondents did not know that diet could affect blood sugar levels; 66.5 % did not know that shaking and sweating were signs of low blood sugar, and 55.3% did not know that taking sugary things when dizzy is necessary for people living with diabetes. Similar findings were reported in previous studies by Khamseh and Baradaran in Iran 29; Desalu et al. in Nigeria 30; Seid in Ethiopia 31 and Hasnain in Pakistan32. These findings highlight the problem of low self-care knowledge being widespread across different socio-cultural, economic, and geographical areas. It raises many questions related to the appropriateness, content, packaging, and mode of delivery of the diabetic health information given to patients in these regions.

Importantly, most people with diabetes in our study recognized the importance of exercise in the control of blood glucose. However, in the study among medical students in Ugandan universities, knowledge regarding the benefits of exercise in control diabetes control was found low33. This means

Table 4. Participants' frequency of self-care practice in the recent one week, N=228

Practice of self-care activities	Frequency	%
Dietary practices		
Following a healthy eating plan		**75.4**
≤ 3 days a week	124 (54.4)	
4-7 days a week	104 (45.6)	
Incorporating fruits and vegetables in diet		**94.3**
≤ 3 days a week	90 (39.5)	
4-7 days a week	138 (60.5)	
Consuming of fried food products		**19.7**
≤ 3 days a week	217 (95.2)	
4-7 days a week	11 (4.8)	
Consumption of fat diet		**28.9**
≤ 3 days a week	219 (96)	
4-7 days a week	9(4.0)	
Exercise		
At least 30 minutes of exercise daily		**84.7**
≤3 days a week	73 (32.1)	
4-7 days a week	155 (68.0)	
Medications		
Adhering to oral hypoglycemic drugs		**72.8**
≤ 3 days a week	68 (29.8)	
4-7 days a week	160 (70.2)	
Adhering to insulin therapy		**99.9**
Foot care		
Washing feet		**89.9**
≤ 3 days a week	26 (11.4)	
4-7 days a week	202 (88.6)	
Drying in between toes		**50.0**
≤ days a week	122 (53.5)	
4-7 days a week	106 (46.5)	
Inspecting inner surface of shoes		**52.6**
≤ 3 days	143 (62.7)	
4-7 days	85 (37.3)	
Examining feet		**61.8**
≤ days a week	110 (48.3)	
4-7 days of a week	118 (51.8)	
Blood glucose testing		**83.3**

that future health practitioners may not effectively deliver the right messages to the patients hence the need to strengthen related content in the curriculum for medical programs.

Low diabetes self-care knowledge is a risk for developing adverse diabetes-related complications that are associated with large socio-economic burdens to patients, families, and health care systems 11,18,34. Therefore, there is an urgent need by health care policymakers to drastically review and revamp the diabetes health education strategies to raise self-care knowledge among people living with diabetes, to mitigate the occurrence of complications35.

Factors Affecting Self-care Knowledge among People with Diabetes

Receiving health education on every scheduled clinic visit (AOR: 4.0; 95%CI:1.52-10.50; P=0.005) and duration with diabetes for 11 years or more (AOR: 2.9;95% CI:1.25-6.82; P=0.014) were independently associated with adequate self-care knowledge among participants. Those who reported having received diabetes health education every clinic visit were 4 times more knowledgeable than

Table 5. Logistic regression for participants' Characteristics and Self-care Practice

Variable	Bi-variate Analysis		Multi-variate analysis	
	COR [95%CI]	P-value	AOR [95%CI]	P-Value
Education level		**0.0005***		
None	1.0		1.0	
Primary	4.4 [1.73-11.04]		3.4 [1.09-10.47]	0.035*
Secondary	4.6 [1.51-13.73]		3.7 [0.85-15.96]	0.082
Tertiary	10 [2.75-36.34]		5.2[0.95-28.34]	0.057
Duration with DM		**0.0028***		
Less than 5 years	1.0		1.0	
6-10 years	2.4 [1.26-4.63]		3.3[1.31-8.06]	0.011*
11 years and above	2.9 [1.42-5.93]		3.2 [1.09-9.56]	0.035*
Health education Frequency		**P<0.001***		
Never	1.0		1.0	
Once	2.6 [0.78-8.56]		1.4 [0.33-5.68]	0.667
Twice	0.8 [0.22-3.08]		0.2 [0.04-0.98]	0.048*
More than twice	6.2 [2.05-18.76]		2.4 [0.62-9.27]	0.203
Every clinic visit	7.9 [2.69-23.07]		2.8 [0.76-10.67]	0.121
Sources of health education				
Media		**0.0025***		
No	1.0		1.0	
Yes	2.6 [1.36-4.90]		4.1 [1.66-10.06]	0.002*
Friends		**0.0047***		
No	1.0			
Yes	2.3 [1.27-4.00]			
Knowledge level		**0.0007***		
Inadequate	1.0			
Adequate	2.7 [1.50-4.83]			

COR-Unadjusted Odds Ratio, AOR-Adjusted Odds Ratio, *Statistically significant.

those who never received it. Many other studies 19,26,36,37 reported similar findings.

The reported adequate self-care knowledge associated with receiving health education at every clinic visit could be attributed to the fact that receiving health education at every clinic visit will have the effect of reinforcing knowledge and enhancing comprehension. It is noteworthy that a related study in Zimbabwe 13 reported no association between health education and self-care knowledge. However, this study had significant differences from our study regarding the study setting and sample size, which could have influenced the different outcomes. Participants in our study were those attending diabetic clinics managed by expert clinicians with diabetes-related appropriate knowledge in the hospital, while the study in Zimbabwe 13 recruited participants from a diabetic association managed by people with diabetes whose knowledge level was lower than that of experts. The sample size for our study was 228, much bigger than the sample of 58 in the Zimbabwean study.

Furthermore, participants who had lived with diabetes for 11or more were almost 3 times more knowledgeable on diabetes self-care than those with 5 years or less. This implies that a longer duration with diabetes may raise chances of exposure to the knowledge sources like specific diabetes health care education, through sharing experiences with fellow patients and interaction with health workers 38. Our findings emphasize the need to organize and provide diabetes health education to patients with diabetes at every clinic visit, giving more priority to patients with a shorter duration with diabetes.

On the contrary, findings from Berhe et al 14 never showed an association of self-care knowledge with the duration with diabetes (AOR=1.2, P- value= 0.244). This inconsistency with the current study could have been due to the differences in sampling procedure whereby the cur-

rent study used consecutive sampling over 6 weeks, while Berhe's study employed a systematic random sampling method that could have considered the entire sampling frame in the two hospitals over 12 weeks, for a longer period.

Diabetes Self-care Practice among People with Diabetes

Diabetes self-care practices were assessed based on domains, namely: foot care; dietary practices; physical activity, blood glucose testing, and taking medications. Overall, the proportion of participants with adequate self-care practices in the previous week was very low (35%). This finding highlights the prevailing risk for the development of diabetes-related complications that are usually associated with inadequate self-care practices. Related studies conducted in Ethiopia, by Gurmu et al.38 and Ayele et al.39 also reported a low level of self-care practice, 45%, and 39.2% respectively. The observed similarities in findings could be attributed to considerable similarities in the study design, sample size, and participant socio-demographic characteristics between those Ethiopian studies and our study. However, Jackson et al 40 in Nigeria reported a higher degree of diabetes self-care practice (79.5%) among people living with diabetes. Jackson et al differed from our study concerning the inclusion criteria. Our study included respondents with a diabetes duration of at least 6 months, while Jackson et al considered only patients with a duration of 1 year and above. Longer duration of the disease is associated with better self-care practice because of long experience with medications and longer exposure to diabetes in self-care health education.

For the recent self-care practice for the individual activities in the previous week, a practice most of the time was considered for those who practiced four times or more and a rare practice for those who practiced for less than four times in the recent week.

Regarding foot care practices, more than half of respondents (53.5%) did not dry in between the toes most of the time through the week, and slightly more than half of the respondents (51.8%) did not examine their feet for any damage to the skin as routinely as required in the previous week. A high proportion of respondents (62.7%) did not regularly examine the interior of their footwear to look for thorns or any other foreign bodies that could harm their feet. This could have been due to ignorance of the importance of protecting the feet from injuries. Foot injuries among people with diabetes heal poorly and sometimes lead to complications like; diabetic foot, amputations due to poor peripheral circulation. Previous studies in India 15,41 and Pakistani 32 also reported low levels of adequate foot-care practices, further emphasizing the gravity of the risk for foot injuries and related complications among people living with diabetes across large geographical and socio-cultural areas.

Adequate foot care was, however, reported at 82.9% by Dedefo et al. 42 in Ethiopia; and 78% by Gunggu et al. 43 in Malaysia. These two studies differed from our study regarding inclusion criteria and sociodemographic characteristics. Both studies included patients with at least a 1-year duration of diabetes, while our study included patients with at least 6 months duration with diabetes. The longer one stays with diabetes, the more experience in self-care is expected. In Dedefo et al 42 studies, more than half of the respondents (51.2%) were urban dwellers compared to 71% rural dwellers in our study. Access to health care education through contact with health care workers is easier for urban than rural dwellers because of easier means of transport over shorter distances. Furthermore, there is a higher concentration of radio stations as well as other electronic media channels in urban centers through which health education programs are transmitted, increasing knowledge, influencing attitude, and hence affecting behavior 12. Another important difference was in the sample sizes used. Our study had a smaller sample size of 228 respondents compared to 252 and 400 respondents for Dedefo et al 42. and Gunggu et al 43 respectively. All these could have contributed to the observed differences in foot care practices between our current study and those two studies. This suggests a greater need to focus on rural dwellers, to identify their challenges, and holistically devise solutions to enhance their self-care practices in diabetes care.

Regarding dietary practices, almost half of the patients (46%) did not follow a healthy eating plan most of the time (4-7 times a week). This could have been related to inadequate knowledge of the dietary plan and the expected food types and quantities as per the dietary plate and /or lack of access to all the required food staff due to financial constraints. However, Gunggu et al. 43 in Malaysia reported a slightly higher proportion (60.8%) of re-

spondents who followed a healthy eating plan. This could have been because Gunggu et al. used a larger sample size with almost half of the respondents (49.4%) living with diabetes for more than 5 years. In the current study, the sample size was smaller, with the majority of respondents (53.3%) living with diabetes for less than 5 years. Longer duration with diabetes is associated with experience in eating habits and suitable food staff for the diabetic individual due to higher chances of exposure to information over a longer period.

Concerning exercise, a considerably high proportion of respondents (84.7%) reported participation in some form of exercise for at least 30 minutes throughout the week. However, lower percentages of exercise activities of 40% and 29.1% were reported by Kiberenge et al.44 in Kenya and Gunggu et al. 43 in Malaysia respectively. It is important to note that Kiberenge et al. had the general population as the study target while the current study only targeted people living with diabetes who had better exposure to diabetes self-care education. More than half of Gunggu et al. study participants were Urban dwellers whose lifestyles may differ as compared to the current study's respondents due to the variation in the kind of activities the urban and rural dwellers get involved in. The majority in our study (71%) were rural dwellers whose main activities generally involve a lot of physical work given the fact that the majority were peasants spending the most time in the garden and farm.

Regarding medication, adherence among respondents with insulin-dependent diabetes was 99.9%, while adherence to oral hypoglycemics was relatively much lower at 70%. This could be attributed to the life-threatening nature of presentation in poorly controlled insulin-dependent diabetes as compared to the less severe presentation in non-insulin-dependent diabetes. Those with the insulin-dependent type of diabetes tend to be more cautious in following medication prescriptions to avoid abnormal glycemic states that can be more life-threatening. Comparable findings were reported by Shyamsundar et al. 15 where 82% of the participants had taken their medications at regular intervals most times of the week.

Blood glucose testing was also assessed in the previous month based on the fact that most rural participants rarely tested within a week. This is because they didn't have glucometers and testing from other facilities was expensive for them. They could only test blood glucose on clinic visit days which was also at a cost. This is a great concern noted because blood glucose levels guide almost other interventions to diabetic control. For example; when blood glucose is high, one would reduce the insulin doses, or oral medications, adjust diet and other self-care activities.

People with diabetes need to be supported by the health care team to enhance their overall self-care practice, guiding them to identify self-management challenges and develop strategies to solve them, including setting self-selected behavioral goals45 noting that it takes time (about 2–8 months) to change a habit or apply behavior.

Factors Affecting Self-care Practice among People with Diabetes

In our study, independently associated factors with self-care practice were; primary level of formal education (AOR 3.4; 95%CI [1.09-10.47]; P-value 0.035); duration with diabetes more than five years (AOR 3.3; 95%CI [1.31-8.06]; P-value 0.011); receiving health education twice (P<0.01) and media as a source of information (AOR 4.1; 95%CI [1.66-10.06], P-value= 0.002). Generally, those with primary/basic level education were 3.4 times more likely to have adequate self-care practices than those without formal education. This may be because having at least basic formal education makes one able to easily read, understand and follow instructions. Having higher education levels is important to improve knowledge, and knowledge provides a positive attitude which is then translated into practice 36,46-48.

Furthermore, the odds of having adequate self-care practices were 3.3 times higher in respondents who had lived with diabetes for more than five years than those who lived with diabetes below five years. Consistent findings were reported by Zandiyeh et al. 19; Dedefo et al. 42; and Amente et al. 49. This could be because people who have stayed with the disease for long have more experience of signs, treatment, consultations, and meetings with peers who are also a source of advice and motivation to practice as well as the teaching provided by health professionals during follow-up visits 20,50.

In addition, participants whose major source of diabetes health education was media were 4.1 times more likely to have adequate self-care practices than those without access to media information. The evidence from our study underlines

the importance of the source of health education in diabetes self-care management. Policymakers should consider putting more educational programs through media channels because of the impact it has on self-care practices. A randomized controlled study was done in the Cardiovascular Rehabilitation Clinic, Endocrinology Clinic, and Geriatrics Clinic at Xiangya Hospital, Central South University, China51, highlighted the need for patient-centered health education, especially in areas with lower education levels, and low socio-economic status to identify their problems and strategies to address them to maximize the benefits of practicing self-care. This is very characteristic of rural communities of which this current study dominates, given the fact that they respect their time to work in the fields (peasants) and cultural norms which may restrict them to reaching clinics and hospitals for consultation or programmed sessions on self-care education. More to that, DSME/S is now being incorporated into office practices, medical homes, and accountable care organizations45. Receiving DSME/S in alternative and convenient settings, such as community health centers and pharmacies, and through technology-based programs needs to be embraced in all settings to enhance practice.

The major strength of our study was that it uncovered the status of people with diabetes regarding their self-care knowledge and practice level in rural southwestern Uganda. Specific gaps in specific self-care activities were also clearly explained and the contributing factors to these gaps were. The study indirectly gives a picture of what major challenges are faced by people with diabetes practice of their diabetes self-care given the fact that the proportion of diabetic people receiving health education is low, the majority are newly diagnosed yet increased health education frequency and longer duration with diabetes influence knowledge and practice. This brings possible solutions closer since the responsible stakeholders will be able to devise more appropriate strategies, well organized and packaged to support the victims to manage the existing challenges. The study also had a larger sample size. However, the study was limited by having susceptibility to recall bias because participants had to remember their recent self-care practices. This was minimized by limiting the recall period of self-care practices to one week apart from blood glucose testing which was limited to the previous one month given the fact that the majority rarely tested and only tested on clinic visit days still at a cost due to lack of a glucometer at home for self-testing and high costs in the clinics. Participants were also consecutively selected, which could lead to a selection bias. This was mitigated by maximizing client participation, ensuring that almost all who met the inclusion criteria and consented were included in the study.

6 Conclusion

The situation analysis, revealed low self-care knowledge and practice, especially in; recognition and management of hypoglycemia; aspects of foot care; and adherence to oral medication. Receiving health education, at every clinic visit and duration of diabetes of 11 years or more independently affected diabetes self-care knowledge. Primary education level; receiving health education twice, duration of diabetes for 5 years or more, and the media as a source of diabetes health education were independent factors of diabetes self-care practice. The study, therefore, underlined the need to provide health education to patients at every clinic visit with special attention to patients with a recent diabetes diagnosis and those without formal education, especially in the rural settings. Determining how, and to what extent the diabetes self-management educational program (DSME) was implemented in Uganda and assessing the type and content of diabetes self-care given to the patients need further study.

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The study had no source of funding

7 Competing interests

The authors declare no competing interest.

Availability of data

The full dataset generated and analyzed during the current study is not publicly available to maintain the privacy of the individuals interviewed during this study. However, de-identified data can be made available from the corresponding author upon reasonable request.

Authors' contributions

GN conceived the study idea, GN, RK and MMM designed the study, collected and analyzed data, interpreted the results; and drafted the manuscript. GN, RK, EK, MMM, and RL revised and approved the final manuscript.

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